

The High Desert Observer

The Bulletin of the Astronomical Society of Las Cruces

December, 2008

HO-HO-HO, SAYS THE PRES!

Why so cheerful? My term as President is all but over! Actually, I think it's one of those complex happy/sad occasions. Thankfully, we have a new enthusiastic club president, Mr. Jerry Gaber. He and his excellent Board of Directors are definitely making 2009 look fun & exciting! Remember (as I well know) that he needs your support in a big way to make it happen! So let's all get on board and "Follow our Leader" in 2009, the International Year of Astronomy!

Our club-sponsored garage sale of Phillip Herron's scopes & accessories is over and "we done good." All together \$6750 was collected, of which we will receive 20% as our "commission"...not a trivial amount. Most of the stuff was sold to club members!

Congrats go to Jerry McMahon, new Meade LX200GPS owner, and also to our new Pres Jerry G., a new Obsession owner!!

Hopefully everyone who bought feels they got a bargain and also contributed to the club. Thanks to all who helped (Jerry, George) and to all who bought. It was good to chat with all the members who came out, in a different sort of venue than normal for our Society. We also promoted our club to several local aspiring astronomers who came looking for bargains.

And of course our last major event of 2008 - the 6th Annual ASLC Christmas Party - was something really special. Serving as our December club meeting, it was perhaps our largest event of the year - over 45 were in attendance. All was, in a word, excellent - the setting, the food, the fellowship, the slideshow...I could go on & on. We all enjoyed Mike & Carol's spacious & beautiful hacienda, with observatory, observing deck, big Dob,...by the way, did Carol ever get out of the kitchen? The creativity displayed by our members in both cuisine and artful presentations was unprecedented. Many heartfelt thanks to everyone who contributed to the evening (too many to list!), and especially to our gracious hosts the Shericks. It was great to end our get-togethers for 2008 on such a pleasant note.

And what a fine year for the Society and its members! We had many wonderful speakers, top-notch public outreach, award-winning website & newsletter, outstanding astro-images, and cutting-edge scientific contributions. Try as we might, however, we were kept from spending some major funds on a dedicated solar-scope and public-oriented club observatory. Alas, with any luck at all, Jerry will get to oversee the implementation of those ventures. I have enjoyed the privilege of leading & representing our Society, and endeavored to steer the Society in healthy directions. I hope 2009 will bring some new & different activities our way, possibly with a social twist and involving other regional or state astro clubs...there is much to be gained from sharing with new sky-loving friends. After all, as I often say, it's the oh-so-interesting people involved in this "hobby" that really make it so fun & fascinating. So stay curious, stay connected, and stay open. Stellar Stargazin' in 2009! — Nils



The Astronomical Society of Las Cruces (ASLC) is dedicated to expanding members and public awareness and understanding of the wonders of the universe. ASLC holds frequent observing sessions and star parties, and provides opportunities to work on club and public educational projects. Members receive *The High Desert Observer*, our monthly newsletter, membership in the Astronomical League, including AL's quarterly *A.L. Reflector*. Club dues are \$35 per year. Those opting to receive the ASLC newsletter electronically, receive a \$5 membership discount. Send dues, payable to ASLC with an application form or a note to: Treasurer ASLC, PO Box 921, Las Cruces, NM 88004.

ASLC members are entitled to a \$10 discount on subscriptions to *Sky and Telescope* magazine.

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Next Meeting

The next monthly meeting will be held January 23rd at 7:30 pm in the usual place (Main Campus of the Dona Ana Community College, room 77). The speaker will be Ann Owen. The topic will be Archeoastronomy.

The imagers' group will meet at 7:00 pm.

The monthly dark sky viewing night will be held on Saturday, December 29th at the Upham site. Please see the ASLC website for further information:

<http://www.aslc-nm.org>.

January Issue of the *HDO*

Articles for the January issue should be sent to Tony Gondola by January 10th. Text should be sent as email (acgna@comcast.net) or as an attached Microsoft Word document. Images should be sent in jpg format.

If you have any questions about submitting something to the *HDO*, please don't hesitate to contact me at 571-5118 or via email. Thanks in advance! Tony Gondola, Editor, ASLC Newsletter

Minutes, November 2008 ASLC Meeting

Call to Order:

Nils Allen, President, Astronomical Society of Las Cruces (ASLC), called the meeting to order at 7:40 pm., 21 Nov 2008, Rm. 77, Dona Ana Community College.

President's Comments:

Nils Allen, Club President, welcomed the group and noted that this month's meeting was being held a week earlier than usual to avoid conflict with the Thanksgiving holiday. He thanked Mike and Carol Sherick for hosting last month's meeting at their home and observatory. He also reminded the members present that voting for Club officers for 2009 will occur at this meeting.

Secretary's Report:

The minutes for the September meeting were submitted as published in the current issue of the Club newsletter, the High Desert Observer (HDO). Bill Stein moved to accept the minutes as published, Wes Baker seconded. The minutes were accepted by acclamation of the members present.

Treasurer's Report:

The treasurer reported the balances of the Club's various accounts. She also distributed updated pages for the Club member directory. She announced that she will be ordering copies of the Royal Astronomical Society of Canada (RASC) handbook and circulated a request list. Price of the handbook will be \$19.00 per copy. She also reported that OPT is changing their ordering system to receive a Club-related discount on purchases; members will not have to obtain the discount number from her in the future. High Point Scientific also offers Club members a discount. There was no additional treasurer's report.

Committee Reports

Observatory Committee:

There was no progress to report.

Nominating Committee:

The list of candidates willing to serve next year was published, along with a ballot, in the HDO.

Old Business:

There was no old business discussed.

New Business:

1. NRAO symposium - Proceedings from the meeting in October in Socorro, NM, are available for review after the meeting.
2. Astronomy equipment - Legal issues have delayed the disposition of Philip Herron's estate. An astronomy equipment "garage sale" will take place from 10:00 am to 4:00 pm on 22 November at 5036 Apex Mine Trail. A listing of the equipment and proposed prices is available. Nils Allen and Jerry Gaber are organizing the items but will need some help from other members conducting the sale. As compensation for our efforts the Club will receive 20% of the net proceeds.

3. Christmas Party/December meeting - The December meeting/event will be a holiday party at Mike and Carol Sherick's home (5626 Tierra Sagrada) on 06 December from 5:00 to 8:00 pm. The Allens and the Shericks will supply the entrees (turkey and brisket), Club members are asked to provide "pot-luck-style" side dishes (A-M: vegetables, other sides, N-Z: desserts/sweets) and door prize items. Nils needs a head count for attendees by December 1st.

4. Election results - Following the ballot count, all the candidates up for election were accepted. Officers for 2009 are as follows:

President:	Jerry Gaber
Vice-President:	Kirby Benson
Secretary:	John McCullough
Treasurer:	Janet Stevens
Director-at-Large:	Wes Baker, George Hatfield

5. Meade SolarScope - The solar telescope has been on order for over a year. Rich Richins proposed and Vince Dovydaitis seconded that Steve Barkes be allowed to purchase a similar telescope via AstroMart. Discussion about other available sources followed. Janet Stevens suggested contacting Meade one more time to allow them to fill the order. Janet and Steve will proceed with efforts to obtain either the ordered telescope or an alternative.

Announcements:

1. Renaissance ArtsFaire, 2008 - This year's Faire on 01 & 02 November at Young Park is complete. Nils Allen thanked the Club members that helped set-up and tear-down and manned the booth for the weekend. Another successful Faire.

2. MoonGaze - A monthly MoonGaze was held 08 November at International Delights Café on El Paseo. The December MoonGaze will be 06 December.

Observations:

No observational reports were presented.

Rich Richins offered a motion to adjourn and Jerry Gaber seconded. The business portion of the meeting was adjourned at 8:15 pm by acclamation of those present.

Presentation:

This month's program was presented by Dave Williams. His topic was "Palomar: My Time with the Big Eye." Dave started his association with Mt. Wilson and Palomar Observatory very early in his life. In fact, he and the 200-inch telescope saw first light the same year. Dave grew up playing on the grounds of the observatory and eventually spent his technical career at the observatory. He presented technical drawings and historical photographs of the facility giving an up-close and personal description of the equipment. He also recounted numerous anecdotes of his years on Mt. Wilson. This presentation was recorded for rebroadcast on the Internet. This and other meeting presentations can be accessed on the web at <http://www.aics-research.com/lectures/aslcnm/>. The November 2008 monthly meeting concluded at 9:25 pm.

Respectfully submitted by John McCullough, ASLC Secretary



First Event of 2008! ASLC's 7th Annual "New Scope Owners Clinic"

Did one of your friends or family get a new scope for Christmas this year? Or might they have one stashed away that's rarely used? Well, you can be sure that several Las Crucens fall into this category. It so happens that one of our Society's main goals is to assist anyone with the desire to successfully enjoy our night skies. Add to that the fact that many of our members have the technical expertise and people skills to make that happen for just about anyone. Thus the "New Scope Owners Clinic" was born and continues again this year! It's also just a great time to publicize our Society and its offerings to the general public.

We have set January 3 as the date for this FREE annual clinic, to be held at Veterans Park on Roadrunner. Knowledgeable volunteers (you know who you are!) are needed to be on-hand between 2 and 5:00 pm to assist new (and not-so-new) owners

with minor repairs, operation and maintenance of their telescopes. Some basic tools, collimation tools, etc. are good to bring. Last year we had quite a few needy and/or curious people show up, so at least a half-dozen helpers are needed. So put this date on your calendars and join us if you possibly can! Please let Chuck Sterling know if you expect to make it - anyone is welcome to join us. If folks hang around and the weather is OK we may do some observing afterwards as darkness falls, assisting folks with possibly their first real stargazing session. So come prepared!

Santa and the Heavenly Body

By Bonnie Allen

Tw'as the night before Christmas and all through the house

My astronomer hubby was nowhere close to his spouse.

The stockings they were hung by the chimney with care,

Yet his monster scope was pointed high up in the air.

As I grumbled 'n complained he exclaimed "Can't you see..."

Jupiter, Venus and the slender moon make three."

So I snuggled in my jammies & watched some old flix

Hugging a big bowl of popcorn I had just fixed.

Why then I jumped and ran when I heard such a clatter

I was sure he had fallen off the top of the ladder.

He was jumping & digging through lenses with a tone of pleading,

"That Ethos ultra-wide is really what I be needing"

"For I discovered a comet, but it's gone just now,

I'll find it again, I'm sure ... somehow"

"It must really be cooling, as it was all red"

"That was just Santa!" I said, shaking my head.

"So come on inside," I said with a slight frown

"if you're lucky another Heavenly Body might be found"

"Sweetheart," he said, "there's no need to fight"

"I'll see you again on the next cloudy night"

The Saga of 2008 TV26

By Bert Stevens

Most of the time when I am doing my follow-up observations of Near-Earth Objects (NEOs), it is pretty routine. I access the Minor Planet Center (MPC) website and they have a tool that provides me a list of NEOs that need observing. I comb through the list and pick out the objects that I can observe that night and work them into a schedule that fits in the dark hours available that night.

When my automated observatory system has finished taking the sequence of images, I stack them using the predicted motion of the NEO. This makes the stars appear as streaks, and the NEO appears as a dot. I usually take enough images to make three stacks so I get three observations. The software can then measure the position at a sub-pixel level to give me an accurate position. I then report the positions to the MPC. They use my observations to improve the accuracy of the object's orbital parameters so we can find it in the future. It also removes it from the list of NEOs that need more observations, so I get new targets the next night.

The targets I get are usually found near the center of my field-of-view. If the object's orbit is not well known, then it might be a few minutes of arc from the center of the field. Since my system provides a 13-minute field of view, this is not a problem. When doing follow-up, I almost always find the NEO. There are occasions when an asteroid is much fainter than predicted, since a highly elliptical asteroid will be much fainter end-on than side-on, but I can usually create a single stack with all the images, allowing me to see over a magnitude fainter.

On October 18, the MPC listed the NEO 2008 TV26 as a target for that night. It was predicted to be magnitude 20.1, not particularly bright, but well within the range of my equipment. It had been discovered on October 8 by Tzec Maun Observatory, at New Mexico Skies near Mayhill, New Mexico, on October 8. They had observed it again the next night as did Spacewatch at Steward Observatory on Kitt Peak, Arizona. Tzec Maun Observatory observed it again on October 13. It had not been seen for almost a week, so it was now in need of more observations. I added it to the observing program for that night and started up that night's run.

The next morning, I started reducing the images. When I stacked the images from 2008 TV6, I could not find anything in the field. Thinking it was simply faint, I stacked all the images together, but there was still no 2008 TV26. I skipped over 2008 TV6 and reduced the rest of the images from that night. After I sent in my other measurements, I took another look at 2008 TV26. Pulling up the ephemeris from the MPC, the predicted position was right in the center of the image and there were no stars in the area to hide the asteroid. The uncertainty of the ephemeris was just a few seconds of arc. It should have been there.

I knew that I was one of the smaller observatories doing NEO follow-up, with a relatively small field-of-view of 13 minutes-of-arc across. So I put out an e-mail on the Minor Planet Mailing List (MPML):

If anyone has a chance, could you please take a look at NEO 2008 TV26? I was unable to find it within 6' of the predicted position down to mag 20.5. I am sure it is just the inadequacy of my equipment, but I thought I would bring this to everyone's attention.

Clear and dark skies!

- Bert

Among the people on the MPML is orbit-computer Bill Gray. He pulled the observations and checked them to be sure they “hung together” and did not show any signs of a bad linkage. He also checked for an oddball double-orbit case, where a small set of observations can present multiple possible orbit solutions. There was no indication of a problem.

The Royal Observatory of Belgium reported observations of 2008 TV26 on October 20, but they were far from the predicted position. So either the observations from Royal Observatory on October 20 were wrong, or the October 13 positions from Tzec Maun Observatory were wrong. To sort the situation out, David Tholen used a telescope at Mauna Kea to observe the positions predicted by ignoring first Royal Observatory of Belgium’s observation and then Tzec Maun Observatory’s observation.

After they reduced their observations, they determined that Royal Observatory of Belgium’s observations were correct and the October 13 observations from Tzec Maun Observatory were of a different object. Once the October 13 position was removed from the orbit solution, 2008 TV26 was placed outside my field-of-view. The new orbit solution also meant that 2008 TV26 was really a routine main-belt asteroid, and not an NEO at all.

When queried as to what could be done better to keep these kind of problems from happening, Bill Gray said:

In a perfect world, a longer arc on the first few nights would be really useful. For example, the spurious observations on 13 October spanned fifteen minutes. That wasn’t really long enough to get a solid motion vector. If those three observations had been spread out over an hour, instead of over 15 minutes, it might have been obvious that the motion of the object didn’t link up with the previous nights. Two hours would have been even better.

This is why I generate three observations if at all possible of an NEO. The fainter ones require exposure of an hour or two, giving plenty of time to get a motion vector. If the observed positions do not fit the predictions, then the images will not stack properly and the NEO will be drawn out into an elliptical blur. Tzec Maun Observatory would have taken more images to get a longer spread, but clouds moved in and ended their observing run.

So now you know the saga of 2008 TV26, and how it almost became a lost NEO, when really it was just a run-of-the-mill main belt asteroid. Our observations (in this case the lack of them) help to keep track of the objects in our sky that could be a danger to the Earth.

The Perspective that Age Brings

Wirt Atmar

We live in an extraordinary time, if you're willing to bend the rules a bit and include the last 500 years as "our time." We're now answering questions with a provable certainty that have been asked for as long as men have possessed language.

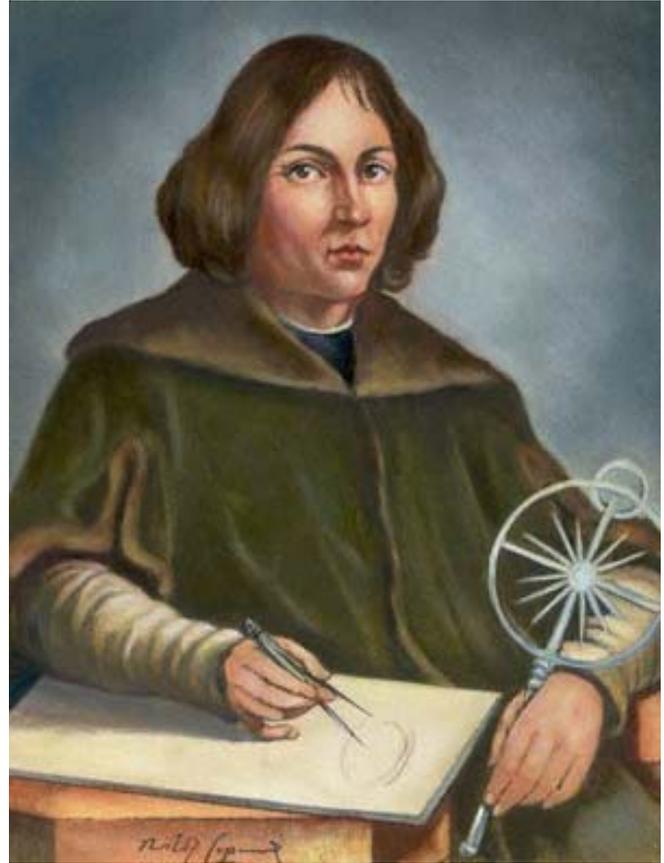
The beginnings of formal Western science can be traced back to a single point in time: the life and work of the physician Copernicus (1473-1543). His major work, *De revolutionibus orbium coelestium*, was published the year of his death, after more than three decades of thought, and a half century before Galileo first looked at the heavens with a telescope. "The Copernican Principle" is the philosophical statement that no "special" observers need be proposed to explain our position in the heavens.

We still conduct our science by invoking this principle: that the laws of physics and chemistry are the same everywhere, the only modification being that we now call this general line of thought the "Principle of Mediocrity." The Earth is now believed to be a mediocre planet, orbiting a mediocre star in a mediocre galaxy, occupying an infinitesimally small, mediocre corner of the universe.

The obvious extension of this principle is then to ask the question: "Are we alone in the universe?" Phrased another way, what is the probability that any of the billion billion stars we see at night similarly harbor life and intelligence?

Giordano Bruno, in 1584, answered the question in this manner, invoking Copernicus' Principle:

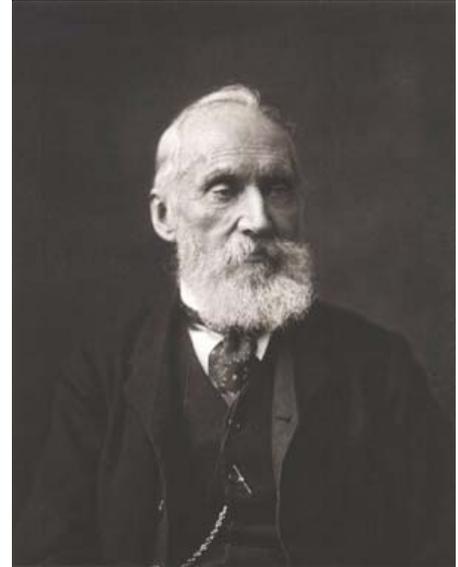
Thus the earth no more than any other world is at the centre; and no points constitute definite determined poles of space for our earth, just as she herself is not a definite and determined pole to any other point of the ether, or of the world space; and the same is true of all other bodies. From various points of view these may all be regarded either as centres, or as points on the circumference, as poles, or zeniths and so forth. Thus the earth is not in the centre of the universe; it is central only to our own surrounding space.



*Nicolaus Copernicus' epochal book, *De revolutionibus orbium coelestium* (On the Revolutions of the Celestial Spheres), is commonly regarded as the defining epiphany that began the Scientific Revolution.*

If this is so, and after 400 years of observation and investigation we have no reason to doubt that's it not, then we cannot believe that there is anything special about the Earth or the life that inhabits it. If one earth exists, then there must be many. Some of the most fundamental questions in this line of inquiry then became: "How old is the Earth?" "How long it did take life to evolve here on Earth?" and "How old is the Universe itself?" It's from the answers to these questions that we can begin to get a sense of how likely there is extraterrestrial life and intelligence elsewhere in the Universe.

The first person to calculate the age of the Earth scientifically was Lord Kelvin (1824-1907). Kelvin was a devout Christian, and because of that, he was also an ardent anti-evolutionist. However, due to his calculations, which he performed repeatedly over his 50-year professional career, slowly moving his estimates of the age of the Earth from 200 Myr to 100 Myr to 20 Myr, he managed to make everyone he knew irritated with him. Both the young Earth Biblical literalists and professional biologists and geologists, were furious with Kelvin. His estimates were far too old for the Creationists, so much so as to be sacrilege. Simultaneously, his estimates were far too young for the processes that the biologists and geologists were seeing.



Lord Kelvin (William Thomson) was the first to rigorously calculate the age of the Earth using scientific principles. He refined his calculations over the whole of his scientific career. His only failure was that he was catastrophically wrong in his estimates.

Kelvin based his estimates on the newly discovered rise in temperatures measured in the deep mines that were then just being dug at several locations in the world, and on the new mathematics of heat transfer of Jean Baptiste Joseph Fourier, a French thermodynamicist. The standard story, one told in almost every college classroom, is that Kelvin's calculations were greatly in error because he didn't know of the sequestration of nuclear isotopes in the molten core of the Earth. However that story isn't complete or even correct. Recently, in January 2007, a short historical paper was published in *GSA Today* demonstrating that this popular story is incorrect.

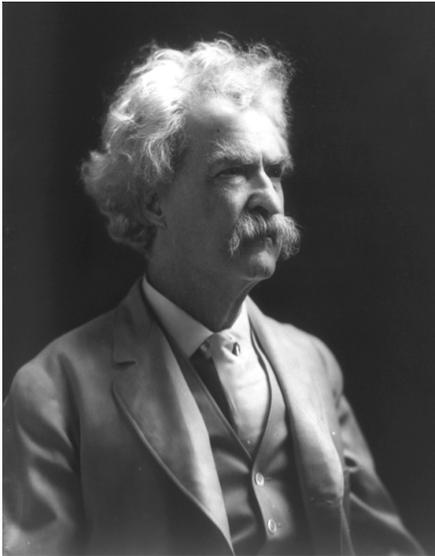
Introducing the known distribution of radioactivity into Kelvin's calculation doesn't invalidate his conclusions, as is often stated. But the internal convections of the molten Earth do. In 1895, before the discovery of radioactivity, another geologist, John Perry, showed that convection in the Earth's interior would make a mess of Kelvin's estimate for the age of the Earth, but Kelvin's stature was such that Perry's analysis was neglected or forgotten.

The scientific story of the geologists and biologists versus Lord Kelvin is often told as a David versus Goliath epic, Kelvin's reputation being as unassailable as it was. Surprisingly, one of the people most associated with dethroning Kelvin's conclusions was Mark Twain. Twain's life (1835-1910) paralleled the rapid development of geology and paleontology in the late 19th and early 20th centuries and the introduction of the societally disturbing new paradigms of deep geologic time and Darwinian evolution. Twain's use of geological and paleontological references in his writing evolved along with the science.

Twain's most important essay appears below. When you read it, read it as if you're reading a scientifically literate version of Dave Barry. Twain has all the basic facts quite correct; he just makes up some of the organismal names. Ammonites and trilobites are real. Ganoids, asteroids and alkaloids aren't.

In the abstract for his talk at the 2002 Geological Society's annual meeting, Stephen Rowland (UNLV) described Twain's essay in this manner:

In his 1903 essay 'Was the world made for man?' Twain discussed, without the sarcasm of earlier years, the views of Charles Lyell and Lord Kelvin about the age of the Earth. In this case he used these views to satirize the biblical perspective that the events of earth history occurred specifically to prepare earth for humans. The evolution of Twain's use of geology and paleontology reflects, and helped to bring about, an increasing credibility and respectability for these fields within American society...



Mark Twain's 1903 essay on the age of the Earth was instrumental in the public's acceptance of the new sciences of geology, paleontology and evolutionary biology.

"Was the World Made for Man?"

Mark Twain

1903

"Alfred Russell Wallace's revival of the theory that this earth is at the center of the stellar universe, and is the only habitable globe, has aroused great interest in the world." – Literary Digest

"For ourselves we do thoroughly believe that man, as he lives just here on this tiny earth, is in essence and possibilities the most sublime existence in all the range of non-divine being – the chief love and delight of God." – Chicago "Interior" (Presb.)

I seem to be the only scientist and theologian still remaining to be heard from on this important matter of whether the world was made for man or not. I feel that it is time for me to speak.

I stand almost with the others. They believe the world was made for man, I believe it likely that it was made for man; they think there is proof, astronomical mainly, that it was made for man, I think there is evidence only, not proof, that it was made for him. It is too early, yet, to arrange the verdict, the returns are not all in. When they are all in, I think they will show that the world was made for man; but we must not hurry, we must patiently wait till they are all in.

Now as far as we have got, astronomy is on our side. Mr. Wallace has clearly shown this. He has clearly shown two things: that the world was made for man, and that the universe was made for the world – to steady it, you know. The astronomy part is settled, and cannot be challenged.

We come now to the geological part. This is the one where the evidence is not all in, yet. It is coming in, hourly, daily, coming in all the time, but naturally it comes with geological carefulness and deliberation, and we must not be impatient, we must not get excited, we must be calm, and wait. To lose our tranquility will not hurry geology; nothing hurries geology.

It takes a long time to prepare a world for man, such a thing is not done in a day. Some of the great scientists, carefully deciphering the evidences furnished by geology, have arrived at the conviction that our world is prodigiously old, and they may be right, but Lord Kelvin is not of their opinion. He takes a cautious, conservative view, in order to be on the safe side, and feels sure it is not so old as they think. As Lord Kelvin is the highest authority in science now living, I think we must yield to him and accept his view. He does not concede that the world is more than a hundred million years old. He believes it is that old, but not older. Lyell believed that our race was introduced into the world 31,000 years ago, Herbert Spencer makes it 32,000. Lord Kelvin agrees with Spencer.

Very well. According to Kelvin's figures it took 99,968,000 years to prepare the world for man, impatient as the Creator doubtless was to see him and admire him. But a large enterprise like this has to be conducted warily, painstakingly, logically. It was foreseen that man would have to have the oyster. Therefore the first preparation was made for the oyster. Very well, you cannot make an oyster out of whole cloth, you must make the oyster's ancestor first. This is not done in a day. You must make a vast variety of invertebrates, to start with – belemnites, trilobites, jebusites, amalekites, and that sort of fry, and put them to soak in a primary sea, and wait and see what will happen. Some will be disappointments - the belemnites, the ammonites and such; they will be failures, they will die out and become extinct, in the course of the 19,000,000 years covered by the experiment, but all is not lost, for the amalekites will fetch the home-stake; they will develop gradually into encrinites, and stalactites, and blatherskites, and one thing and another as the mighty ages creep on and the Archaean and the Cambrian Periods pile their lofty crags in the primordial seas, and at last the first grand stage in the preparation of the world for man stands completed, the Oyster is done. An oyster has hardly any more reasoning power than a scientist has; and so it is reasonably certain that this one jumped to the conclusion that the nineteen-million years was a preparation for him; but that would be just like an oyster, which is the most conceited animal there is, except man. And anyway, this one could not know, at that early date, that he was only an incident in a scheme, and that there was some more to the scheme, yet.

The oyster being achieved, the next thing to be arranged for in the preparation of the world for man, was fish. Fish, and coal to fry it with. So the Old Silurian seas were opened up to breed the fish in, and at the same time the great work of building Old Red Sandstone mountains 80,000 feet high to cold-storage their fossils in was begun. This latter was quite indispensable, for there would be no end of failures again, no end of extinctions – millions of them – and it would be cheaper and less trouble to can them in the rocks than keep tally of them in a book. One does not build the coal beds and 80,000 feet of perpendicular Old Red Sandstone in a brief time – no, it took twenty million years. In the first place, a coal bed is a slow and troublesome and tiresome thing to construct.

You have to grow prodigious forests of tree-ferns and reeds and calamites and such things in a marshy region; then you have, to sink them under out of sight and let them rot; then you have to turn the streams on them, so as to bury them under several feet of sediment, and the sediment must have time to harden and turn to rock; next you must grow another forest on top, then sink it and put on another layer of sediment and harden it; then more forest and more rock, layer upon layer, three miles deep – ah, indeed it is a sickening slow job to build a coal-measure and do it right!

So the millions of years drag on; and meantime the fish-culture is lazying along and frazzling out in a way to make a person tired. You have developed ten thousand kinds of fishes from the oyster; and come to look, you have raised nothing but fossils, nothing but extinctions. There is nothing left alive and progressive but a ganoid or two and perhaps half a dozen asteroids. Even the cat wouldn't eat such. Still, it is no great matter; there is plenty of time, yet, and they will develop into something tasty before man is ready for them. Even a ganoid can be depended on for that, when he is not going to be called on for sixty million years.

The Palaeozoic time-limit having now been reached, it was necessary to begin the next stage in the preparation of the world for man, by opening up the Mesozoic Age and instituting some reptiles. For man would need reptiles. Not to eat, but to develop himself from. This being the most important detail of the scheme, a spacious liberality of time was set apart for it – thirty million years. What wonders followed! From the remaining ganoids and asteroids and alkaloids were developed by slow and steady and pains-taking culture those stupendous saurians that used to prowl about the steamy world in those remote ages, with their snaky heads reared forty feet in the air and sixty feet of body and tail racing and thrashing after. All gone, now, alas – all extinct, except the little handful of Arkansawrians left stranded and lonely with us here upon this far-flung verge and fringe of time.

Yes, it took thirty million years and twenty million reptiles to get one that would stick long enough to develop into something else and let the scheme proceed to the next step.

Then the Pterodactyl burst upon the world in all his impressive solemnity and grandeur, and all Nature recognized that the Cainozoic threshold was crossed and a new Period open for business, a new stage begun in the preparation of the globe for man. It may be that the Pterodactyl thought the thirty million years had been intended as a preparation for himself, for there was nothing too foolish for a Pterodactyl to imagine, but he was in error, the preparation was for man. Without doubt the Pterodactyl attracted great attention, for even the least observant could see that there was the making of a bird in him. And so it turned out. Also the makings of a mammal, in time. One thing we have to say to his credit, that in the matter of picturesqueness he was the triumph of his Period; he wore wings and had teeth, and was a starchy and wonderful mixture altogether, a kind of long-distance premonitory symptom of Kipling's marine:

*'E isn't one O'the reg'lar Line,
nor 'e isn't one of the crew,
'E's a kind of a giddy harumfrodite [hermaphrodite] –
soldier an' sailor too!*

From this time onward for nearly another thirty million years the preparation moved briskly. From the Pterodactyl was developed the bird; from the bird the kangaroo, from the kangaroo the other marsupials; from these the mastodon, the megatherium, the giant sloth, the Irish elk, and all that crowd that you make useful and instructive fossils out of – then came the first great Ice Sheet, and they all retreated before it and crossed over the bridge at Behring's strait and wandered around over Europe and Asia and died. All except a few, to carry on the preparation with. Six Glacial Periods with two million years between Periods chased these poor orphans up and down and about the earth, from weather to weather – from tropic swelter at the poles to Arctic frost at the equator and back again and to and fro, they never knowing what kind of weather was going to turn up next; and if ever they settled down anywhere the whole continent suddenly sank under them without the least notice and they had to trade places with the fishes and scramble off to where the seas had been, and scarcely a dry rag on them; and when there was nothing else doing a volcano would let go and fire them out from wherever they had located. They led this unsettled and irritating life for twenty-five million years, half the time afloat, half the time aground, and always wondering what it was all for, they never suspecting, of course, that it was a preparation for man and had to be done just so or it wouldn't be any proper and harmonious place for him when he arrived.

And at last came the monkey, and anybody could see that man wasn't far off, now. And in truth that was so. The monkey went on developing for close upon 5,000,000 years, and then turned into a man - to all appearances.

Such is the history of it. Man has been here 32,000 years. That it took a hundred million years to prepare the world for him is proof that that is what it was done for. I suppose it is. I dunno. If the Eiffel tower were now representing the world's age, the skin of paint on the pinnacle-knob at its summit would represent man's share of that age; and anybody would perceive that that skin was what the tower was built for. I reckon they would, I dunno.

Despite the errors, Kelvin's calculations nonetheless had significant scientific value. While the numbers were wrong, for the first time, the Earth came to be believed to have a finite age. Up until Kelvin's line of argument, many geologists had believed that the Earth was exceedingly old, perhaps infinitely so.

This same argument would come roaring back in the 1950s with Fred Hoyle's "steady-state" universe and his dismissal of the "Big Bang," a term he derisively used for the idea of a finitely-aged Universe, but that controversy similarly proved to be exceedingly valuable to our understanding in calculating the probabilities of life evolving elsewhere.

Next month: The evolution of Life, the Universe and Everything.

Images from the ASLC Christmas Party
Thanks to everyone involved for making this a wonderful event!





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